Important Advances in Clinical Medicine

Epitomes of Progress—Anesthesiology

The Scientific Board of the California Medical Association presents the following inventory of items of progress in Anesthesiology. Each item, in the judgment of a panel of knowledgeable physicians, has recently become reasonably firmly established, both as to scientific fact and important clinical significance. The items are presented in simple epitome and an authoritative reference, both to the item itself and to the subject as a whole, is generally given for those who may be unfamiliar with a particular item. The purpose is to assist the busy practitioner, student, research worker or scholar to stay abreast of these items of progress in Anesthesiology which have recently achieved a substantial degree of authoritative acceptance, whether in his own field of special interest or another.

The items of progress listed below were selected by the Advisory Panel to the Section on Anesthesiology of the California Medical Association and the summaries were prepared under its direction.

Reprint requests to: Division of Scientific and Educational Activities, California Medical Association, 731 Market St., San Francisco, CA 94103

Obstetrical Anesthesia

REGIONAL ANESTHESIA has become increasingly popular in obstetrics. With this technique, it is possible for a mother to remain awake and unnarcotized, able to participate in the birth of her baby with minimal risk of vomiting and aspiration. Continuous lumbar epidural block for regional delivery allows segmental T-10 to T-12 levels to be achieved in early labor with relatively small amounts of local anesthetic. As opposed to caudal block, the avoidance of sacral anesthesia during the first stage allows the pelvic muscles to retain their tone and rotation of the fetal head is more easily accomplished. When used for cesarean section, lumbar epidural block provides slower onset and consequently more controllable anesthetic levels and cardiovascular alterations than does spinal anesthesia.

When local anesthetics are administered to produce epidural, paracervical, pudendal nerve or local infiltration anesthesia they are rapidly absorbed from the site of injection, cross the placenta and appear in fetal blood. The clinical significance of this placental transfer depends on the blood level achieved in the fetus. Following use of relatively large maternal doses, high levels in fetal blood do occur and may cause adverse cardiovascular and central nervous system effects.

Of the amide-type local anesthetics, bupivacaine (Marcaine®), because of its high degree of binding to maternal protein, has the lowest fetal-maternal blood ratio and is probably the safest long-acting local anesthetic drug in obstetrics at present. It has been shown that neurobehavioral responses in newborn infants of mothers receiving bupivacaine epidurals are not significantly different from babies whose mothers have not been given such anesthesia. However, in some normal newborns delivered after maternal epidural anesthesia with mepivacaine or lidocaine, muscular hypotonia, diminished Moro reflexes and decreased rooting activity during the first eight hours of life have been noted. Furthermore, the neonatal half-life of bupivacaine is less than two hours while that of lidocaine and mepivacaine are four and ten hours, respectively.

When rapid onset and short duration of action are desired, 2-chloroprocaine (Nesacaine®) may be used. This ester-type local anesthetic is so rapidly hydrolyzed by plasma cholinesterase (half-life in venous blood of 21 seconds) that placental transfer of clinically significant amounts of drug is unlikely. Some anesthesiologists prefer to initiate an epidural block with 2-chloroprocaine, maintain the anesthesia with bupivacaine and then switch back to 2-chloroprocaine for the final perineal dose.

GERSHON LEVINSON, MD

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Doses of Heparin and Protamine

HEPARIN REQUIREMENTS for cardiopulmonary bypass surgical procedures are usually calculated in milligrams or units of heparin per kilogram of body weight. However, this method of calculation may result in a seriously inappropriate dose of heparin due to wide differences between patients in their response to heparin and in the rate of its metabolic breakdown. Although variable response to drugs is common, heparin is exceptional because during surgical operation on the heart, inadequate heparinization can lead to serious, sometimes life-threatening coagulopathies.

At Loma Linda University the anticoagulant effect of heparin and its decay rate have been studied in 50 patients in whom cardiopulmonary bypass was done by measuring the activated coagulation time (ACT) of whole blood. To produce the desired activated coagulation time of eight minutes, the required loading dose of heparin differed by a factor of 3, with a range of 3.2 to 9.0 mg per kg of body weight. In the same group of patients, the half-life of heparin differed by a factor of 5, ranging from 0.8 to 4.5 hours.

This wide variability between patients insures that when the commonly used dose protocols are applied to a series of patients, some will be inadequately heparinized and others will receive much more heparin than they need.

Allowance for variations in patient response to heparin can be provided by constructing a dose-response curve from ACT measurements. Such a curve relates the clotting time to heparin dose in each patient and permits the calculation of the heparin dose required. At the completion of bypass the same dose-response curve can be used to determine how much heparin activity remains in the patient, and consequently the amount of protamine required to neutralize it.

The determination of activated coagulation time is a simple test that can be done in the operating room by relatively unskilled personnel. It permits accurate control of heparin doses and subsequent neutralization with protamine, removing the guesswork from a procedure in which a bad guess can be disastrous.

BERNARD BRIGGS, MD

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Ketamine

KETAMINE is an anesthetic agent that was introduced several years ago with much fanfare. Initial claims for the drug were grossly exaggerated and appeared in general circulation newspapers and magazines in addition to the medical literature. Now, after the initial wave of overenthusiasm as well as a backlash phase, it seems appropriate to consider what ketamine can and cannot do.

It is clear that even though laryngeal and pharyngeal reflexes often are not depressed or not notably depressed, ketamine cannot be given safely to every patient with a full stomach without danger of vomiting and aspiration of vomitus. There have been reports of patients who did vomit and aspirate after the drug was given. Nevertheless, there is some value in the relative sparing of laryngeal and pharyngeal reflexes. Ketamine is a potent analgesic agent and does produce anesthesia. It may be useful given alone or with other agents for certain kinds of procedures. These include (1) neurodiagnostic procedures such as myelograms, ventriculograms and pneumoencephalograms where the increase in the intracranial pressure produced by ketamine is not detrimental to the patient and